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Determinants of Catastrophic Healthcare Expenditure in Peru

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ABSTRACT

The aims of this study were to assess factors associated with catastrophic healthcare expenditure (CHE) and the burden of out-of-pocket (OOP) payments for specific healthcare services in Peru. We used data from 30966 households that participated in the 2016 National Household Survey (Encuesta Nacional de Hogares, ENAHO). Participants reported household characteristics and expenditure on ten healthcare services. CHE was defined as healthcare spending equal to or higher than 40% of the household's capacity to pay. The associations of various household characteristics and OOP payments for specific healthcare services with CHE were assessed in logistic regression models. Poorer, rural and smaller households as well as those with older adults and individuals with chronic conditions had greater odds of facing CHE. According to the estimates from the adjusted regression model, healthcare services could be grouped into three groups. Medical tests, surgery and medication were in the first group with odds ratios (ORs) between 6.43 and 4.72. Hospitalisation, outpatient, dental and eye care were in the second group with ORs between 2.61 and 1.46. Child care, maternity care and other healthcare services (such as contraceptives, rehabilitation, etc.) were in the third group with non-significant ORs. Many Peruvian households are forced to finance their healthcare through OOP payments, burdening their finances to the extent of affecting their living standards.

Keywords: health services/utilization; health expenditures; developing countries; adults.

KEY MESSAGES

- Around 4% of households incurred out-of-pocket expenses that were 40% or above their capacity to pay. Large social and geographical inequalities in catastrophic healthcare expenditure were found.
- Medical tests, surgery and medication were the services imposing the greatest financial burden on households. Sixty-two percent of households paid for medication.
- Child and maternity care were not associated with catastrophic healthcare expenditure, suggesting that the health system is covering those essential healthcare services.

INTRODUCTION

A global call to achieve universal health coverage is now in place (WHO 2010), with specific targets and indicators to monitor progress set as part of the 2030 agenda for Sustainable Development (United Nations 2015). Financial risk protection is an underpinning principle of universal health coverage (United Nations 2015; WHO 2016; Wagstaff et al. 2018; Wagstaff et al. 2018). International agencies recommend using the incidence of catastrophic healthcare expenditure (CHE) due to out-of-pocket (OOP) expenses for health services to track levels of financial protection (Boerma et al. 2014; WHO/World Bank 2015). Healthcare spending is defined as 'catastrophic' when it exceeds a certain fraction of household's disposable income (O'Donnell et al. 2008; Wagstaff 2008).

Measuring CHE helps policy planners monitoring reductions in OOP payments reported in national health accounts, and characterising sub-groups of the population that are more vulnerable to financial hardship and potential impoverishment (WHO/World Bank 2015; Sweeney et al. 2016). Previous studies have shown that CHE is more common among poorer and more unequal countries (Xu et al. 2003; Xu et al. 2007) as well as in rural, smaller and poorer households, those with older adults and/or young children and those with no health insurance (Knaul et al. 2011; Kimman et al. 2015; Alshamsan et al. 2017; Mohanty et al. 2017). In addition, the use of specific healthcare services, such as inpatient care, prescription drugs, dental services, and visits to traditional healers, may lead to CHE (Saksena et al. 2010; Kim et al. 2011; Brinda et al. 2014; Masood et al. 2015; Ozgen Narci et al. 2015). A multilevel study across 40 low-and-middle income countries showed that all types of healthcare services affected household finances, with a clear divide between OOP payments for drugs, hospitalisation, ambulatory care and tests, on one hand, and, dental care, healthcare products, traditional medicine and other health services, on the other hand (Bernabe et al. 2017).

Latin American countries are moving towards universal health coverage, mainly through a mix of decentralisation of health system functions, conditional cash transfer schemes and coverage-oriented health system reforms (Atun et al. 2015; Wagstaff et al. 2015; Mathauer et al. 2017). Peru has been one of the fastest growing economies in the Latin-American and Caribbean region over the past 25 years. However, Peru's economic growth has not been reflected in the health sector; the total expenditure on health was 5.5% and the government health expenditure was 3.3% of Gross Domestic Product in 2014 (Atun et al. 2015). The Peruvian government is aiming to achieve universal health coverage through a bottom-up approach by first ensuring a national Comprehensive Health Insurance

for the low-income population (i.e. the Sistema Integral de Salud or SIS) that will gradually match the Social Health Insurance (SHI) benefits plan for formal sector employees –which covers highly complex illnesses– (Cotlear et al. 2015). In 2010, 63% of the population had health insurance: 37% in SIS, 20% in SHI, and 6% in private sector (PAHO 2012). A previous study found that 5% of households faced CHE (defined at the 30% income threshold) in 2006, being more common in rural areas and households with at least one young child, with at least one older adult, with 2 or fewer members and with uninsured members (Knaul et al. 2011). Within the current context of health system reforms, the aim of this study was to assess factors associated with CHE among Peruvian households. A secondary aim was to compare the burden of out-of-pocket payments for specific healthcare services.

MATERIALS AND METHODS

Data source

This study used cross-sectional data from the 2016 National Household Survey (Encuesta Nacional de Hogares, ENAHO) in Peru. ENAHO is a nationally representative survey that collects information on several dimensions of well-being of Peruvian families every year. The sample was recruited using stratified cluster random sampling. Data were collected through structured interviews at home with every household member, except children and those who were not present at any of the visits made by interviewers throughout the year. The number of target households in ENAHO 2016 was 44919, of which 35785 (79% response rate) were interviewed.

For this study, 4789 of the participating households were excluded because not all household members completed the survey questionnaires (n=4784), they have missing values in relevant variables (education=10, employment status=16) or the head of the household was younger than 18 years (n=9). Therefore, the study sample included 30,966 (87%) of the households interviewed.

Variables

Annualised expenditure data were extracted to estimate CHE, which was calculated as the ratio of all OOP payments for healthcare services to the household's capacity to pay (total expenditure minus food expenditure) (Xu et al. 2003; Wagstaff 2008). Healthcare expenditure is considered 'catastrophic' when it surpasses a determined threshold during a specified period. The threshold represents a predefined proportion of household income or expenditure, which can vary from 5% to 40% (Arsenijevic et al. 2013; Goryakin et al. 2014). Lower thresholds are typically used when total income or expenditure is used as

the denominator whereas higher thresholds are used when food expenditure is subtracted from the denominator (O'Donnell et al. 2008). The latter approach assumes that food and healthcare expenditure are not substitutes (Wagstaff 2008). For this study, households that spent 40% or more of the household's capacity to pay on healthcare services during the past 12 months met this criterion. This threshold has been reported by the World Health Organization (Xu et al. 2003; Xu et al. 2007). OOP payments associated with use of outpatient care, medication, medical tests (laboratory analysis, x-rays and other exams), dental care, eye care (ophthalmology and eye glasses), child care (vaccines and health checks), hospitalisation, surgery, maternity care (antenatal and delivery) and other healthcare services (such as contraceptives, rehabilitation, etc.) were reported during interviews with households' members. The recall period for use of healthcare services varied from the last four weeks (outpatient care, medication, and medical tests) to the last three months (dental care, eye care, child care, and other services) to the last 12 months (hospitalisation, surgery and maternity care). Individual responses were combined to define whether at least one household's member paid for each type of health service.

Several characteristics of the household's head and the household were included in the analysis as potential confounders (Saksena et al. 2010; Kim et al. 2011; Knaul et al. 2011; Brinda et al. 2014; Kimman et al. 2015; Masood et al. 2015; Ozgen Narci et al. 2015; Alshamsan et al. 2017; Mohanty et al. 2017). Relevant characteristics of the head of household were sex, age (18-24, 35-44, 45-64, 65-74, 75+ years), marital status (single, married and formerly married), education (none, primary, secondary and higher) and employment status (whether the household's head was in paid employment in the past two weeks). Household characteristics were income (after taxes and deductions) recoded into quartiles, household size (<4 or 4+ members), settlement (urban or rural) and whether there were children under 5 years of age (none, 1, 2+), adults aged 60 years or older (none, 1 or 2+), members with chronic conditions (none, 1, 2 or 3+) and members with health insurance (none, some or all members) in the household.

Statistical analysis

Data analysis incorporated the complex survey design (stratification and clustering) to obtain appropriate confidence intervals and weights to produce nationally representative estimates. All analyses were conducted in Stata SE release 14 (StataCorp LLC, College Station, TX).

We first compared the proportion of households incurring CHE according to household characteristics using the Chi-squared test. The association between household characteristics and CHE was assessed in crude and adjusted logistic regression models, as CHE was an uncommon (<10%) dichotomous outcome (Barros et al. 2003). Odds ratios (OR) were therefore reported as the measure of association. The adjusted model controlled for all covariates (head of households' sex, age group, marital status, education and employment, and household income, household size, settlement, young children in the family, older adults in the family, members with chronic conditions and health insurance coverage). The average adjusted predicted probabilities (predictive margins) for CHE were computed considering the observed distributions of all the covariates in the adjusted regression model.

We then compared the proportion of households facing CHE according to whether the household paid for each of the 10 health services evaluated, using the Chi-square test. The association between each type of healthcare service and CHE was subsequently assessed in adjusted and mutually adjusted logistic regression models. The adjusted model controlled for all household characteristics whereas the mutually adjusted model additionally controlled for all other types of healthcare services. The average adjusted predicted probabilities for CHE were computed from the mutually adjusted regression model.

RESULTS

The characteristics of the study sample are shown in Table 1. There were differences between the study sample and those excluded from the analysis. The study sample was more likely to contain poorer and smaller households and those where all members were covered by health insurance. The prevalence of CHE in the last year was 4.09% (95% Confidence Interval: 3.79-4.38). CHE was more common among households where the head was older, less educated and unemployed. CHE was also more common among households in rural areas, with lower income, fewer members, no young children, and among those with older adults, members with chronic conditions and uninsured members. After adjustments, education and living with young children were no longer associated with CHE. Households in rural areas and those with older adults and members with chronic conditions had greater odds of facing CHE. In addition, households with more members, higher income, health insurance, and whose head was younger, in paid employment and formerly married had lower odds of facing CHE (Table 2). Adjusted predicted probabilities of CHE according to household characteristics are shown in Table S1.

From the ten healthcare services evaluated, OOP payments for medication (61.54%) and other healthcare services (54.40%) were the most commonly incurred, followed by outpatient and dental care (17.79% and 17.55%, respectively). CHE was significantly more common among those who paid for every type of healthcare services, except for child care, maternity care and other healthcare services (Table 3). These patterns remained similar after controlling for OOP payments for other healthcare services. According to the estimates from the mutually adjusted model, services could be divided into 3 groups based on their impact on household finances. The first group included medical tests, surgery and medication, which had the largest odds (6.43 to 4.72) of facing CHE. The second group included hospitalisation, outpatient, dental and eye care, which had odds ratios between 2.61 and 1.46. The last group included child care, maternity care and other healthcare services which had no significant odds ratios (Table 4). Adjusted predicted probabilities of CHE according to specific healthcare services are presented in Table S2.

DISCUSSION

This study shows that around 4% of Peruvian households incurred OOP expenditure, in the past 12 months, that surpassed 40% of their capacity to pay. Although this figure is lower than for other middle-income countries (Bernabe et al. 2017), it is very similar to the estimate reported from ENAHO 2006 (5% prevalence using a lower income threshold, 30%) (Knaul et al. 2011). Therefore, our findings suggest there has not been much progress in reducing the financial risk of OOP payments for healthcare over the last decade.

We also found that poorer, rural and smaller households as well as those with older adults and individuals with chronic illness were more vulnerable to CHE. The existence of social and geographical inequalities in CHE is alarming because our estimates only reflect households that have found a way to afford use of healthcare services. There seems to be no immediate effects of government's expanded coverage to people outside the formal work sector – i.e. those informally employed and the poor– (Atun et al. 2015). This is in addition to the problem faced by households (often the poorest) that forgo healthcare services simply because they cannot afford them. As our analysis was based on expenditure rather than data on refraining from required healthcare services, we may be underestimating the true impact of lacking financial risk protection. Having more family members could help minimise CHE as there are more income earners sharing the responsibility to pay for healthcare services and a larger network of contacts outside the household whom they could approach in case of financial need. Higher

numbers of older adults and members with chronic illness in the household were also associated with CHE, which could be explained by the country's increasing burden of non-communicable diseases (PAHO 2012; GBD 2016 DALYs and HALE Collaborators 2017).

Based on the strength of their association with CHE, healthcare services were grouped into three classes that go beyond the simple divide between inpatient and outpatient care. Medical tests, surgery and medication were the services with the greatest odds of CHE, followed by hospitalisation, outpatient, dental and eye care. On the contrary, child care, maternity care and other healthcare services were not associated with CHE. Our findings help identify the type of healthcare services that must be prioritised in benefit packages. Costs for medical tests may be driven by manufacturers-induced demand (oversupply of expensive technology), kickbacks (doctors are paid a fee for every patient referred to certain laboratory services) and defensive medical decision making (as a safeguard from litigation) (WHO 2010). While the cost of medicines may be smaller than for other 'high-ticket' healthcare services, they were the most commonly incurred payments (61.54%) and can accumulate rather quickly, especially for households where there are members with chronic conditions (Saksena et al. 2010). The separation of expenses on surgical procedures and hospitalisation was also informative given that ambulatory (same-day) surgery is an alternative care arrangement to contain hospital costs and improve productivity. Importantly, having some or all members covered by insurance impacted positively on CHE. Slightly over six in every ten households were covered, at least partially by health insurance, especially the SIS for mothers and children, which may explain why the financial burden of maternity and child care were not significant in our analysis.

Our results have some implications for policy and research. Current funding mechanisms to protect Peruvian households are failing and generating unwanted costs to households using needed healthcare services. The WHO has identified medicines and medical tests as two of ten key areas to improve efficiency of healthcare services (WHO 2010). Eliminating unnecessary spending on medicines and using them more appropriately (generics and avoiding overuse) as well as getting the most out of technologies (eliminating supplier-induced demand, kickbacks and defensive medicine) may help protect households from financial hardship. With regards to research, longitudinal/panel data would be more informative to assess the long-term financial effect of OOP payments for healthcare services and the role of multiple health shocks and repeated utilisation of healthcare services to treat chronic conditions.

Some study limitations must be addressed before interpreting the present findings. First, we used cross-sectional data which limits the interpretation of the associations observed due to lack of temporality between the variables of interest. Second, we excluded households where not all members completed the questionnaires. As our study sample included poorer and smaller households and those where all members have health insurance, the present findings are not fully generalisable to the entire Peruvian population. Third, the questions to ascertain use of healthcare services had different recall periods (4 weeks for outpatient care, medication and medical tests, 3 months for dental care, eye care, child care and other health expenditure and 12 months for hospitalisation, surgery and maternity care) which may explain some of the differences found between OOP payments for different healthcare services. However, this did not seem to affect our results as they showed surgery had the strongest association with CHE whereas maternity and child care were not significantly associated with CHE, as reported in other countries in the region (Bernabe et al. 2017). Fourth, we only measured OOP payments for healthcare services as information on indirect costs (such as transportation and missing work hours) was not collected. A lack of consensus regarding the measurement and value of indirect costs make them neglected in most economic evaluations (McIntyre et al. 2006; Krol et al. 2014).

CONCLUSION

OOP payments for healthcare services were common and imposed a financial burden on Peruvian households. Poorer, rural and smaller households and those with senior adults and members with chronic illness were more vulnerable to face catastrophic healthcare expenditure. OOP payments for medical tests, surgery and medication pose the greatest financial burden whereas those for child and maternity care did not pose any burden on households. The Peruvian health system should ensure households use healthcare services when needed and without being financially affected.

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Table 1. Characteristics of the study sample and CHE levels by covariates

Explanatory factors	Sample		CHE			
	n[a]	%	n[a]	%	[95% CI]	p value[b]
Sex						0.504
Men	22769	72.35	923	4.02	[3.69-4.35]	
Women	8227	27.65	350	4.25	[3.66-4.84]	
Age groups						<0.001
18-24 years	702	2.26	7	0.81	[0.10-1.52]	
25-34 years	3932	12.58	87	2.11	[1.56-2.66]	
35-44 years	6526	21.22	138	2.05	[1.62-2.49]	
45-54 years	6935	22.50	193	2.92	[2.39-3.46]	
55-64 years	5826	18.75	287	5.05	[4.30-5.80]	
65-74 years	4150	13.24	293	6.58	[5.61-7.55]	
75+ years	2925	9.46	268	9.40	[8.07-10.74]	
Marital status						0.589
Married	20627	65.52	840	4.10	[3.75-4.45]	
Formerly married	8277	27.46	351	4.19	[3.60-4.77]	
Single	2092	7.02	82	3.58	[2.62-4.54]	
Education						<0.001
None	2297	7.08	165	7.38	[6.06-8.70]	
Primary	11471	34.98	620	5.42	[4.87-5.97]	
Secondary	10810	36.58	344	3.13	[2.70-3.57]	
Higher	6418	21.37	144	2.44	[1.92-2.97]	
Employment						<0.001
Unemployed	5059	17.81	317	6.42	[5.52-7.33]	
Employed	25937	82.19	956	3.58	[3.28-3.88]	
Household income						<0.001
1st quartile (lowest)	7748	22.41	487	6.29	[5.58-7.00]	
2nd quartile	7748	23.89	372	4.93	[4.29-5.58]	
3rd quartile	7751	26.26	236	3.04	[2.54-3.54]	
4th quartile (highest)	7749	27.44	178	2.55	[2.09-3.01]	
Household size						<0.001
<4 members	15711	50.16	892	5.56	[5.07-6.04]	
4+ members	15285	49.84	381	2.61	[2.28-2.94]	
Settlement						<0.001
Urban	18356	70.33	612	3.50	[3.13-3.87]	
Rural	12640	29.67	661	5.48	[5.01-5.94]	
Young children in the family						<0.001
None	23170	75.29	1079	4.57	[4.21-4.93]	
One	6403	20.43	168	2.65	[2.14-3.16]	
Two or more	1423	4.276	26	2.48	[1.32-3.64]	
Older adults in the family						<0.001
None	19684	63.49	476	2.48	[2.19-2.77]	
One	7198	23.57	413	5.46	[4.80-6.11]	
Two or more	4114	12.93	384	9.49	[8.33-10.66]	
Members with chronic conditions						<0.001
None	8030	25.06	175	1.98	[1.62-2.34]	
One	11507	36.71	455	3.93	[3.48-4.39]	
Two	7877	26.01	468	5.89	[5.21-6.58]	
Three or more	3582	12.22	175	5.01	[4.06-5.96]	
Health insurance coverage						0.001
None insured	3594	11.81	202	5.55	[4.51-6.58]	
Some insured	8813	30.16	325	3.65	[3.15-4.16]	
All insured	18589	58.03	746	4.01	[3.66-4.37]	

[a] Counts are unweighted
[b] Chi-squared test was used for comparison

Table 2. Factors associated with catastrophic healthcare expenditure (CHE) among Peruvian households (n=30996)

Explanatory factors	Unadjusted associations		Adjusted associations	
	OR[a]	[95% CI]	OR[a]	[95% CI]
Sex (reference: Men)				
Woman	1.06	[0.90-1.25]	1.10	[0.87-1.39]
Age (reference: 45-54 years)				
18-24 years	0.27	[0.11-0.67]**	0.26	[0.10-0.65]***
25-34 years	0.72	[0.52-0.99]*	0.79	[0.57-1.11]
35-44 years	0.70	[0.52-0.93]*	0.79	[0.60-1.05]
55-64 years	1.77	[1.39-2.24]***	1.16	[0.89-1.53]
65-75 years	2.34	[1.83-2.99]***	1.05	[0.74-1.48]
75+ years	3.45	[2.69-4.41]***	1.39	[0.96-2.01]
Marital status (reference: Married)				
Formerly Married	1.02	[0.86-1.21]	0.71	[0.53-0.96]*
Single	0.87	[0.65-1.16]	0.90	[0.64-1.26]
Education (reference: None)				
Primary	0.72	[0.58-0.90]**	0.92	[0.72-1.18]
Secondary	0.41	[0.32-0.52]***	0.85	[0.62-1.14]
Higher	0.31	[0.23-0.42]***	0.73	[0.50-1.08]
Employment (reference: Unemployed)				
Employed	0.54	[0.45-0.64]***	0.74	[0.61-0.90]**
Household income (reference: 1st quartile - lowest)				
2nd quartile	0.77	[0.64-0.93]**	1.02	[0.84-1.25]
3rd quartile	0.47	[0.38-0.57]***	0.73	[0.57-0.94]*
4th quartile (highest)	0.39	[0.31-0.49]***	0.60	[0.44-0.82]**
Household size (reference: <4 members)				
4+ members	0.46	[0.39-0.53]***	0.53	[0.43-0.65]***
Settlement (reference: Urban)				
Rural	1.60	[1.39-1.84]***	1.35	[1.12-1.63]**
Young children in the family (reference: None)				
One	0.57	[0.46-0.71]***	1.22	[0.95-1.58]
Two or more	0.53	[0.33-0.87]*	1.24	[0.74-2.07]
Older adults in the family (reference: None)				
One	2.27	[1.92-2.70]***	1.35	[1.05-1.74]*
Two or more	4.13	[3.44-4.96]***	1.70	[1.20-2.39]**
Members with chronic conditions (reference: None)				
One	2.02	[1.62-2.52]***	1.61	[1.28-2.02]***
Two	3.09	[2.50-3.83]***	2.28	[1.80-2.89]***
Three or more	2.60	[1.99-3.42]***	2.87	[2.11-3.91]***
Health insurance coverage (reference: None insured)				
Some insured	0.65	[0.51-0.82]***	0.69	[0.53-0.91]**
All insured	0.71	[0.57-0.89]**	0.60	[0.48-0.76]***

[a] Binary logistic regression was fitted and Odds Ratios (OR) reported.
* <0.05; ** <0.01; *** <0.001

Table 3. Catastrophic healthcare expenditure (CHE) according to payment for specific health services among Peruvian households in 2016 (n=30996)

Services	Paid use of services		CHE			
	n[a]	%	n[a]	%	[95% CI]	p value[b]
Outpatient care						<0.001
No	26052	82.21	647	2.58	[2.32-2.84]	
Yes	4944	17.79	626	11.03	[9.92-12.13]	
Medication						<0.001
No	12564	38.46	164	1.36	[1.10-1.63]	
Yes	18432	61.54	1109	5.79	[5.35-6.22]	
Medical tests						<0.001
No	28833	92.22	820	2.78	[2.53-3.02]	
Yes	2163	7.78	453	19.57	[17.44-21.70]	
Dental care						<0.001
No	26011	82.45	984	3.75	[3.45-4.04]	
Yes	4985	17.55	289	5.66	[4.78-6.54]	
Eye care						<0.001
No	28486	90.85	1122	3.86	[3.57-4.15]	
Yes	2510	9.15	151	6.33	[5.09-7.58]	
Child care						0.602
No	30592	98.40	1250	4.08	[3.78-4.37]	
Yes	404	1.60	23	4.71	[2.18-7.23]	
Hospitalisation						<0.001
No	29504	95.24	1044	3.57	[3.28-3.86]	
Yes	1492	4.76	229	14.45	[12.33-16.64]	
Surgery						<0.001
No	30137	96.85	1077	3.56	[3.28-3.84]	
Yes	859	3.15	196	20.17	[16.99-23.35]	
Maternity care						0.529
No	30582	98.60	1259	4.10	[3.80-4.39]	
Yes	414	1.40	14	3.33	[1.21-5.47]	
Other services						0.304
No	15628	45.60	600	3.92	[3.53-4.32]	
Yes	15368	54.40	673	4.22	[3.81-4.63]	

[a] Counts are unweighted
[b] Chi-squared test used for comparisons

Table 4. Association between payment for specific health services and catastrophic healthcare expenditure among 30966 Peruvian households in 2016

Services	Adjusted associations[a]		Mutually adjusted associations[a]	
	OR[b]	**[95% CI]**	**OR[b]**	**[95% CI]**
Outpatient care	7.52	[6.23-9.07]***	2.58	[2.05-3.24]***
Medication	6.96	[5.50-8.80]***	4.72	[3.68-6.06]***
Medical tests	12.98	[10.71-15.72]***	6.43	[5.08-8.15]***
Dental care	2.33	[1.91-2.83]***	2.10	[1.66-2.66]***
Eye care	2.15	[1.66-2.78]***	1.46	[1.06-2.01]*
Child care	1.81	[1.02-3.22]*	0.72	[0.32-1.62]
Hospitalisation	5.72	[4.58-7.13]***	2.61	[1.95-3.48]***
Surgery	9.00	[7.09-11.44]***	5.69	[4.10-7.89]***
Maternity care	1.44	[0.72-2.87]	0.49	[0.20-1.21]
Other services	1.23	[1.06-1.43]**	0.96	[0.81-1.14]

[a] Adjusted for sex, age groups, marital status, education, employment, household income, household size, settlement, young children in the family, older adults in the family, members with chronic conditions, health insurance coverage. The mutually adjusted model additionally controlled for all types of health services.
[b] Binary logistic regression was fitted and Odds Ratios (OR) reported.
*<0.05; **<0.01; ***<0.001

Table S1. Adjusted predictions for catastrophic healthcare expenditure (CHE) by covariates.

Explanatory factors	Categories	Predicted CHE[a]	
		%	[95% CI]
Sex	Men	2.99%	[2.67-3.30]
	Woman	3.27%	[2.64-3.89]
Age groups	18-24 years	0.84%	[0.08-1.60]
	25-34 years	2.55%	[1.83-3.28]
	35-44 years	2.55%	[1.98-3.11]
	45-54 years	3.19%	[2.58-3.80]
	55-64 years	3.70%	[3.05-4.34]
	65-75 years	3.34%	[2.52-4.16]
	75+ years	4.37%	[3.18-5.57]
Marital status	Married	3.37%	[2.94-3.81]
	Formerly Married	2.43%	[1.91-2.96]
	Single	3.03%	[2.16-3.90]
Education	None	3.56%	[2.67-4.45]
	Primary	3.29%	[2.81-3.76]
	Secondary	3.03%	[2.58-3.47]
	Higher	2.64%	[2.04-3.24]
Employment	Unemployed	2.91%	[2.62-3.19]
	Employed	3.89%	[3.22-4.57]
Household income	1st quartile (lowest)	3.78%	[3.09-4.46]
	2nd quartile	3.86%	[3.26-4.46]
	3rd quartile	2.79%	[2.33-3.26]
	4th quartile (highest)	2.30%	[1.82-2.78]
Household size	<4 members	4.16%	[3.65-4.66]
	4+ members	2.24%	[1.91-2.58]
Settlement	Urban	2.81%	[2.48-3.13]
	Rural	3.76%	[3.25-4.27]
Young children in the family	None	2.92%	[2.60-3.23]
	One	3.54%	[2.82-4.27]
	Two or more	3.59%	[1.87-5.31]
Older adults in the family	None	2.68%	[2.32-3.04]
	One	3.57%	[2.93-4.22]
	Two or more	4.45%	[3.31-5.60]
Members with chronic conditions	None	1.85%	[1.49-2.20]
	One	2.94%	[2.55-3.33]
	Two	4.11%	[3.52-4.70]
	Three or more	5.12%	[4.03-6.22]
Health insurance coverage	None insured	4.52%	[3.58-5.46]
	Some insured	3.18%	[2.71-3.66]
	All insured	2.77%	[2.46-3.08]

[a] Predicted probabilities derived from a logistic regression model including all factors listed in the table as explanatory variables.

Table S2. Adjusted predictions for catastrophic healthcare expenditure (CHE) according to payments for specific healthcare services.

Paid used of services		Predicted CHE[a]	
		%	[95% CI]
Outpatient care	No	1.14	[0.95-1.32]
	Yes	2.88	[2.32-3.43]
Medication	No	0.52	[0.39-0.65]
	Yes	2.41	[2.09-2.73]
Medical tests	No	1.16	[0.99-1.33]
	Yes	7.03	[5.48-8.58]
Dental care	No	1.18	[1.01-1.35]
	Yes	2.44	[1.85-3.04]
Eye care	No	1.3	[1.11-1.48]
	Yes	1.88	[1.28-2.48]
Child care	No	1.35	[1.16-1.54]
	Yes	0.98	[0.19-1.76]
Hospitalisation	No	1.28	[1.10-1.47]
	Yes	3.27	[2.34-4.20]
Surgery	No	1.27	[1.09-1.45]
	Yes	6.82	[4.77-8.87]
Maternity care	No	1.35	[1.16-1.55]
	Yes	0.67	[0.07-1.27]
Other services	No	1.37	[1.13-1.60]
	Yes	1.32	[1.11-1.53]

[a] Predicted probabilities derived from a logistic regression model including sex, age groups, marital status, education, employment, household income, household size, settlement, young children in the family, older adults in the family, members with chronic conditions, health insurance coverage and all factors listed in the table as explanatory variables.